

September 25, 2003

Ms. Debbie B. Grinnell
C-10 Research & Education Foundation, Inc.
44 Merrimac Street
Newburyport, Massachusetts 01950

Dear Ms. Grinnell:

I am responding to your letter of June 30, 2003, in which you asked that the U.S. Nuclear Regulatory Commission (NRC) take action to assure that inspections of steam generator (SG) tubes at pressurized water nuclear reactors are adequate to ensure an extremely low probability of abnormal leakage, especially at Seabrook nuclear power plant.

All commercial nuclear power plants with SGs have technical specifications (TSs) issued by the NRC which specify, in part, the requirements for SG tube inspections and repair. NRC inspectors determine, on a sampling basis, whether the licensee's activities meet these requirements. Although NRC Information Notice 2002-21, "Axial Outside-Diameter Cracking Affecting Thermally Treated Alloy 600 Steam Generator Tubing," and its supplement describe the unexpected and unusual tube inspection findings at Seabrook, the two documents also describe the ability of the current tube inspection programs to identify tube degradation. Using standard eddy current testing methods, the licensee identified small cracks in 15 out of approximately 5600 tubes in one of the four SGs. The licensee inspected all the tubes in all four SGs, but identified no other unexpected degradation. The degraded tubes were taken out of service by plugging them before the plant returned to power operation, and two of the tubes were removed from the SG for further testing. The normal differential pressure during power operation is about 1400 pounds per square inch (psi). The maximum pressure expected during a postulated design-basis accident is approximately 2600 psi. The tube with the largest crack was pressure-tested to 7000 psi without leakage, well above the pressure required by the regulations. This indicates that, even with the cracks, the tubes retained significant structural integrity.

In your letter, you quote from J. Hopenfeld's "Differing Professional Opinion (DPO) on Steam Generator Tube Integrity Issues." As a point of clarification, the position stated in the DPO was Dr. Hopenfeld's opinion and not a staff position. The Commission provides the DPO process as one mechanism for any staff member to express views that conflict with established Agency policies or positions. The Executive Director for Operations (EDO) requested that the Advisory Committee on Reactor Safeguards (ACRS) assist in the DPO process, and function as the equivalent of an ad hoc panel, under NRC Management Directive 10.159, to review the technical concerns in the DPO. The EDO requested that the ACRS provide a summary report that documents its conclusions and any recommendations relative to the pertinent technical issues. The ACRS completed its review of the DPO concerns and its findings are documented in NRC Report, NUREG-1740, "Voltage-Based Alternative Repair Criteria," dated February 2001. The report provides a concise summary of the key issues and concerns, and identifies those issues that have been satisfactorily resolved as well as areas where additional staff action is recommended. NUREG-1740 is available from the NRC's Agencywide Documents Access

and Management System (ADAMS), under Accession No. ML010750315. The ACRS found that the alternate repair criteria and the condition monitoring program endorsed by the staff can adequately protect public health and safety, and that no immediate regulatory actions should be taken. For a full description of the staff's position on SG tube integrity, I invite you to read the latest correspondence from the staff to the Commissioners in this area, SECY-03-0080, "Steam Generator Tube Integrity (SGTI) - Plans for Revising the Associated Regulatory Framework," dated May 16, 2003. SECY-03-0080 is available electronically on the NRC Web site under SG Action Plan - Related Documents, or from ADAMS, under Accession No. ML023540491. Although research is still being conducted to confirm the NRC's approach to SG tube inspections, the NRC has not identified a need to impose additional regulatory requirements on licensees based on the research that has been completed in response to the DPO.

In SECY-03-0080, the staff references the regulatory analysis which determined that the existing regulations provide an adequate basis to ensure public health and safety with respect to SG operation. TSs, such as Seabrook's, require periodic tube inspections. The inservice inspection of SG tubes is to be conducted at appropriate intervals, such that the structural and leakage integrity of SG tubes is maintained with appropriate margins. These inspections are expected to be adequate to detect degradation at a sufficiently early stage to preclude the progression of the degradation to the point that the regulatory criteria regarding SG structural and leakage integrity can no longer be met during the interval between inspections. Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," requires that "measures shall be established to assure that special processes, including welding, heat treating, and nondestructive testing, are controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements." SG tube inspections involve nondestructive testing and are covered by these requirements. As noted before, NRC inspectors determine, on a sampling basis, whether the licensee's activities meet these requirements. We consider that these stringent requirements, with NRC oversight, provide an appropriate basis to ensure public health and safety.

As you pointed out, your review of NRC documents, such as the SG Action Plan, showed that improvements continue to be made in techniques and equipment for inspecting SG tubes. The NRC continues to encourage licensees to adopt new and improved techniques and programs once they have been proven to be effective. All licensees have voluntarily adopted the guidance described in the Nuclear Energy Institute's (NEI's) document NEI 97-0, "Steam Generator Program Guidelines," for all SG tube inspections conducted since January 1999. This industry initiative has, for the most part, been successful in ensuring tube integrity as verified through the NRC's inspection and oversight activities. Our statistics on tube failures and forced outages due to tube degradation show no adverse trend in SG tube integrity (for example, refer to the charts on the safety significance of the Indian Point Unit No. 2 tube failure, ADAMS Accession No. ML020880150).

The current regulatory framework for assuring SG tube integrity comprises three main elements, including: (1) the regulatory requirements in the *Code of Federal Regulations*, the plant-specific licensing and design bases, and the TS; (2) industry guidelines and plant-specific programs; and (3) NRC oversight and review of the licensees' SG tube integrity activities. Although the staff continues to believe that the current framework for addressing SG tube

integrity provides assurance that the tube integrity is being maintained, the staff believes that the SG tube surveillance requirements in the TS should be upgraded to better assure the condition of the tubes remains adequate for the period of time between inspections.

We would also note that in some cases, the staff has determined that licensees need to conduct SG tube inspections during the middle of their operating cycle. The staff agrees with you that the TSs for pressurized water reactors should be modified to enhance assurance of SG tube integrity between inspections. The NRC is currently reviewing proposed revisions to the TSs for this purpose. However, as discussed above, licensees must meet the current NRC regulations, and these regulations provide an adequate basis to ensure public health and safety.

Although a SG tube rupture is of low probability, the NRC recognizes that equipment failures can happen. The rupture of a SG tube is a postulated accident for which the plant is specifically designed. This means that the plant safety systems have been designed to cope with such an accident and the operators have been trained in the actions to take, such that any radiological release would remain well below a level that would adversely affect the public's health and safety. There have been some actual SG tube ruptures in this country over the last 30 years, yet none of them resulted in any appreciable dose to the public. The plant safety systems and operator actions have proven effective at mitigating tube rupture events. The NRC has also investigated the consequences of accidents of very low probability, such as simultaneous failure of multiple SG tubes, which was the underlying concern in Dr. Hopenfeld's DPO. As previously indicated, in conjunction with the DPO, the NRC has investigated, and is continuing to investigate, the consequences of design-basis and severe accidents on SG tube integrity. A study was recently completed on the effect of a main steam line break (MSLB) or feedwater line break (FWLB) on the integrity of degraded SG tubes. This study will be issued in the near future as a NUREG/CR report. The results of this study show that the dynamic loads associated with an MSLB (which are greater than the dynamic loads associated with an FWLB) will have little impact on the integrity of the SG tubes, unless extensive circumferential cracking is present. Appropriate eddy current inspection methods are used to detect the presence of circumferential cracking.

The licensee will inspect the SG tubes again during the upcoming Seabrook outage. A summary of the licensee's preliminary inspection plan is enclosed. We will conduct an onsite inspection of the licensee's program for, and conduct of, SG inspections, and will review the licensee's inspection results. The licensee has enhanced their SG tube inspection training program for detecting site-specific outside-diameter stress corrosion cracking (ODSCC) by incorporating samples of thermally treated Alloy 600 tubing containing ODSCC into the training program, even though the previous level of training had been sufficient to detect the ODSCC flaws in the previous outage.

Our inspection reports and the results of our review of the licensee's SG inspection report are all available through our Web site (<http://www.nrc.gov/reading-rm/adams/web-based.html>) and ADAMS. Since you are concerned about Seabrook, I invite you to view the performance indicators and inspection reports specific to Seabrook. If there are any significant issues uncovered by the upcoming tube inspections, we will document these issues, and any associated regulatory action, on our Web site.

D. Grinnell

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Because your letter implied that the NRC staff was not properly enforcing its regulations, your letter has also been forwarded to the NRC's Inspector General.

Thank you for your interest in the safety of nuclear power plants. If you have further questions on this matter, please contact the project manager for Seabrook, Mr. Victor Nerses, at 301-415-1484.

Sincerely,

/RA/

Cornelius F. Holden, Jr., Director
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Enclosure:

Summary of Pre-Outage Conference Call With FPL Energy Seabrook, LLC,
Regarding the Inspection Scope for the Upcoming Steam Generator Inspections
at the Seabrook Station, dated July 23, 2003.

D. Grinnell

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Steam Generator Tube Inspections at Seabrook, June 30, 2003

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